Digital Imaging and Communications in Medicine (DICOM)

Supplement 242: Ultrasound Fetal Cardiac Structured Report Extensions

DICOM Standards Committee

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Scope and Field

This supplement to the DICOM Standard introduces new SR template content to address fetal cardiac assessments in echo reports.

Current clinical practice and technology for fetal cardiac assessments using ultrasound have progressed since Sup78 was published, which introduced TID 5220 "Pediatric, Fetal and Congenital Cardiac Ultrasound Reports" and sub-template TID 5228 "Cardiac Ultrasound Fetal Measurement Section". Practice now includes many more measurements beyond visual assessment. For example, additions will address:

- measurements of the ventricles, atria, septa and valves,
- measurements of fetal arrhythmia and hemodynamics,
- assessment of the fetal cardiovascular profile score (CVPS)

Both the fetal (TID 5228) and pediatric (TID 5221) templates contain multiple inclusions of TID 5222 which is parameterized with CIDs 12282 through 12294 to address specific pieces of anatomy and corresponding measurements. Many measurements described for pediatric echo are also potentially relevant for fetal echo, particularly at later stages of fetal development. To that end, TID 5221 is now included in TID 5228, making any of those measurements readily available as needed and appropriate.

Also, CID 12279, which is titled Cardiac Ultrasound Fetal General Measurement, is pruned here based on usage experience to list just general fetal measurements that are specifically relevant to cardiac fetal ultrasound. CID 12005 Fetal Biometry Measurement already covers fetal measurements relevant to a non-cardiac fetal ultrasound. Since CID 12279 is extensible, any existing implementations with unexpected usages will not be invalidated.

References:

- Fetal Echo Guideline Japan (Second edition) 2021 (https://www.jsfc.jp/wp-content/uploads/2021/06/6ca654442ba6819c3183340bba5cf968.pdf)
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5030052/
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6773963/

CLOSED ISSUES:

Q. Why does TID 5228 Row 8 have multiple containers (1-n) for the same finding site and measurements?

A. To allow different image modes for a given site/measurements perhaps. Otherwise would need to leave image mode blank.

Q. Should we keep Patent Ductus Arteriosus as a Finding Site?

A. No

In the fetal context, Ductus Arteriosus is a valid Finding Site. In the pediatric context, that anatomy normally is gone, but if it persists, the diagnosis is Patent Ductus Arteriosus but the anatomy is still Ductus Arteriosus. In SNOMED, Patent Ductus Arteriosus is a diagnosis code not an anatomy code so it should not be used as a Finding Site. This is consistent with SNOMED having the site of a PDA repair to be "DA".
A New CP is being prepared to fix PDA usage elsewhere in the standard too.

Q. Can we include Left Ventricle Outflow Tract in CID 12291 (Cardiac Ultrasound Aorta Finding Site)?

A. Yes

WG6: Given the "sloppy" practice in the past, this is fine.
While technically this is just before the beginning of the Aorta, the last few existing entries in this CID are already beyond the literal aorta and its parts and measurements are often grouped this way in practice.

Q. Should CID 12291 continue to have codes for all of Descending Aorta, Descending Thoracic Aorta, Thoracic Aorta, and Abdominal Aorta?

A. Yes.

Descending Thoracic Aorta will be used for the LD measurement, but all others might be used in other contexts. None are direct synonyms (i.e. the Venn Diagram has non-overlapping sections)

Q. For UCUM range constraints for the CV Profile Score, can we enumerate values (e.g. 0:1:2)?

A. No.

PS3.16 7.2.2 says the constraints are a min/max value, not an enumeration. We can constrain values in the row description if needed.
https://dicom.nema.org/medical/dicom/current/output/chtml/part16/sect_7.2.2.html

Q. What view codes should be used for fetal echo?

A. Create a new CID (per WG12&6)

Literature (https://obgyn.onlinelibrary.wiley.com/doi/10.1002/uog.2597) references terms that describe the heart orientation terms (Long-axis view, Short-axis view, Four-chamber view, aortic arch view, and oblique short-axis view) but adjectives describing the placement of the probe with respect to anatomical structures like parasternal, subcostal, transesophageal, etc (see CID 12226) are less relevant because the predictable relationship between the anatomical placement of the probe and the orientation of the heart is no longer fixed.
https://dicom.nema.org/medical/dicom/current/output/chtml/part16/sect_CID_12226.html

Q. Are other fetal measurements needed and is a new Root template like TID 5300 warranted with a fully pre-Coordinated codeset?

A. No.

Q. Does the new TID 5228 row for Arterial Duct Arch measurements make sense and is the code right?

A. The row is good, but prefer "Ductus Arteriosus Arch"

Q. Is the constraint appropriate on Row 7 of TID 5xx2 to base the score on the doppler flow at the fetal end of the umbilical artery (rather than the middle or placental end)?

A. No. Leave such constraints to the clinical guidance. Also, support encoding of a measurement as taken in a free cord loop of the umbilical artery.

Changes to NEMA Standards Publication PS3.6

Part 6: Data Dictionary

Add the following UID Values to Part 6 Annex A Table A-3:

TABLE A-3 CONTEXT GROUP UID VALUES

Context UID	Context Identifier	Context Group Name
...	...	…
1.2.840.10008.6.1.newcidUID0	**newcid0**	**Fetal Echocardiography Image View**
1.2.840.10008.6.1.newcidUID1	**newcid1**	**Cardiac Ultrasound Fetal Arrhythmia Measurements**

Changes to NEMA Standards Publication PS3.16

Part 16: Content Mapping Resource

*Modify TID 5220 as shown. TID 5221 is included **unchanged** for reference.*

TID 5220 does not have a hierarchical diagram to update.

TID 5220 Pediatric, Fetal and Congenital Cardiac Ultrasound Reports

This Template forms the top of a content tree that allows an ultrasound application to describe the results of a Cardiac Ultrasound imaging procedure. It is instantiated at the root node.

Type: Extensible
Order: Significant
Root: Yes

Table TID 5220. Pediatric, Fetal and Congenital Cardiac Ultrasound Reports

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	DCID 12245 “Cardiac Ultrasound Report Title”	1	M		Root node
2	>	HAS CONCEPT MOD	INCLUDE	DTID 1204 “Language of Content Item and Descendants”	1	M		
3	>	HAS OBS CONTEXT	INCLUDE	DTID 1001 “Observation Context”	1	M		
4	>	CONTAINS	CONTAINER	EV (18785-6, LN, "Indications for Procedure")	1	U		
5	>>	CONTAINS	CODE	EV (121071, DCM, "Finding")	1-n	U		DCID 12246 “Cardiac Ultrasound Indication for Study”
6	>>	CONTAINS	TEXT	EV (121071, DCM, "Finding")	1	U		
7	>	CONTAINS	INCLUDE	DTID 3802 “Cardiovascular Patient History”	1	U		
8	>	CONTAINS	INCLUDE	DTID 3602 “Cardiovascular Patient Characteristics”	1	U		
9	>	CONTAINS	INCLUDE	DTID 5225 “Cardiac Ultrasound Fetal Characteristics”	1-n	U		No more than one inclusion per fetus
10	>	CONTAINS	INCLUDE	DTID 5226 “Cardiac Ultrasound Summary Section”	1	U		
11	>	CONTAINS	INCLUDE	DTID 5227 “Cardiac Ultrasound Fetal Summary Section”	1-n	U		No more than one inclusion per fetus
12	>	CONTAINS	CONTAINER	EV (111028, DCM, "Image Library")	1	U		
13	>>	CONTAINS	IMAGE		1-n	M		

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
14	>	CONTAINS	INCLUDE	DTID 5221 “Cardiac Ultrasound Pediatric Echo Measurement Section”	1	U		
15	>	CONTAINS	INCLUDE	DTID 5228 “Cardiac Ultrasound Fetal Measurement Section”	1-n	UC	For Fetal Report only.	No more than one inclusion per fetus
16	**>**	**CONTAINS**	**INCLUDE**	**DTID 5xx2 "Fetal Cardiovascular Profile Section"**	**1-n**	**UC**	**For Fetal Report only.**	**No more than one inclusion per fetus**

Content Item Descriptions

Row 3	For Fetal Report, this row establishes the subject context of the mother.
Row 7	For Fetal Report, this row will be the patient history of the mother.
Row 8	For Fetal Report, this row will be the Patient Characteristics for the mother.
Row 10	For Fetal Report, this row will be the Summary Section for the mother.
Row 13	No purpose of reference is specified.
Row 14	**This inclusion of TID 5221 is for pediatric usage. For fetal usage, see Row 9 of TID 5228 where TID 5221 is included and is associated with a specific Fetus Context.**

TID 5221 Cardiac Ultrasound Pediatric Echo Measurement Section

Type: **Extensible**
Order: **Significant**
Root: **No**

Table TID 5221. Cardiac Ultrasound Pediatric Echo Measurement Section

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12282 “Cardiac Ultrasound Venous Return Systemic Finding Site” $MeasType = DCID 12264 “Cardiac Ultrasound Venous Return Systemic Measurement”
2			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12283 “Cardiac Ultrasound Venous Return Pulmonary Finding Site” $MeasType = DCID 12263 “Cardiac Ultrasound Venous Return Pulmonary Measurement”

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
3			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12284 “Cardiac Ultrasound Atria and Atrial Septum Finding Site” $MeasType = DCID 12265 “Cardiac Ultrasound Atria and Atrial Septum Measurement”
4			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12285 “Cardiac Ultrasound Atrioventricular Valve Finding Site” $MeasType = DCID 12268 “Cardiac Ultrasound Atrioventricular Valve Measurement”
5			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12286 “Cardiac Ultrasound Interventricular Septum Finding Site” $MeasType = DCID 12269 “Cardiac Ultrasound Interventricular Septum Measurement”
6			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12287 “Cardiac Ultrasound Ventricle Finding Site” $MeasType = DCID 12259 “Cardiac Ultrasound Ventricles Measurement”
8			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12288 “Cardiac Ultrasound Outflow Tract Finding Site” $MeasType = DCID 12271 “Cardiac Ultrasound Outflow Tract Measurement”
9			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12289 “Cardiac Ultrasound Semilunar Valve, Annulus and Sinus Finding Site” $MeasType = DCID 12272 “Cardiac Ultrasound Semilunar Valve, Annulate and Sinus Measurement”
10			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12290 “Cardiac Ultrasound Pulmonary Artery Finding Site” $MeasType = DCID 12260 “Cardiac Ultrasound Pulmonary Artery”

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
11			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12291 “Cardiac Ultrasound Aorta Finding Site” $MeasType = DCID 12274 “Cardiac Ultrasound Aorta Measurement”
12			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12292 “Cardiac Ultrasound Coronary Artery Finding Site” $MeasType = DCID 12275 “Cardiac Ultrasound Coronary Artery Measurement”
13			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12293 “Cardiac Ultrasound Aortopulmonary Connection Finding Site” $MeasType = DCID 12276 “Cardiac Ultrasound Aorto Pulmonary Connection Measurement”
14			INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = DCID 12294 “Cardiac Ultrasound Pericardium and Pleura Finding Site” $MeasType = DCID 12277 “Cardiac Ultrasound Pericardium and Pleura Measurement”

Modify TID 5228 as shown.

Brings in pediatric echo measurements applicable to fetal echo and adds post-coordinated echo measurements to handle most of the new measurements introduced by this supplement.

TID 5228 Cardiac Ultrasound Fetal Measurement Section

Type: **Extensible**
Order: **Significant**
Root: **No**

Table TID 5228. Cardiac Ultrasound Fetal Measurement Section

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (125016, DCM, "Fetal Measurements")	1	M		
2	>	HAS OBS CONTEXT	INCLUDE	DTID 1008 “Subject Context, Fetus”	1	MC	IF this Template is invoked more than once to	

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
							describe more than one fetus.	
3	>	CONTAINS	INCLUDE	DTID 300 “Measurement”	1-n	U		$Measurement = DCID 12279 “Cardiac Ultrasound Fetal General Measurement”
4	>	CONTAINS	INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = EV (4432005, SCT, "Ductus arteriosus") $MeasType = DCID 12218 “Echocardiography Congenital”
4a	**>**	**CONTAINS**	**INCLUDE**	**DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”**	**1-n**	**U**		**$SectionSubject = EV (newcode21, DCM, "Ductus Arteriosus Arch")** **$MeasType = DCID 12218 “Echocardiography Congenital”**
4b	**>**	**CONTAINS**	**INCLUDE**	**DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”**	**1-n**	**U**		**$SectionSubject = EV (281130003, SCT, "Descending Thoracic Aorta")** **$MeasType = DCID 12218 “Echocardiography Congenital”**
5	>	CONTAINS	INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = EV (367624001, SCT, "Ductus venosus") $MeasType = DCID 12218 “Echocardiography Congenital”
6	>	CONTAINS	INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = EV (50536004, SCT, "Umbilical artery") $MeasType = DCID 12218 “Echocardiography Congenital”
7	>	CONTAINS	INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = EV (367567000, SCT, "Umbilical vein") $MeasType = DCID 12218 “Echocardiography Congenital”
8	>	CONTAINS	INCLUDE	DTID 5222 “Pediatric, Fetal and Congenital Cardiac Ultrasound Section”	1-n	U		$SectionSubject = EV (17232002, SCT, "Middle cerebral artery") $MeasType = DCID 12218 “Echocardiography Congenital”
9	**>**	**CONTAINS**	**INCLUDE**	**DTID 5221 “Cardiac Ultrasound Pediatric Echo Measurement Section”**	**1**	**U**		
10	**>**	**CONTAINS**	**INCLUDE**	**DTID 5xxx "Cardiac Ultrasound Post-Coordinated Measurement Section"**	**1-n**	**U**		

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Content Item Descriptions

Row 4b	**This inclusion of TID 5222 facilitates reporting the PLAS Index (Post-Left Arterial Space) which is based in part on measurements of the descending thoracic aorta.**
Row 9	**This inclusion of TID 5221 facilitates the use of any pediatric echo measurement(s) appropriate for fetal assessment. Some measurements might only be appropriate for late stage fetal assessment. None of the TID 5221 content is inherently pediatric-specific.**
Row 10	**This row permits inclusion of section containers with one or more fully post-coordinated echo measurements.**

Add TID 5xxx for a section of Post-Coordinated Echo Measurements

TID 5xxx Cardiac Ultrasound Post-Coordinated Measurement Section

Type: Extensible
Order: Significant
Root: No

Table TID 5xxx. Cardiac Ultrasound Post-Coordinated Measurement Section

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			**CONTAINER**	**EV (59776-5, LN, "Findings")**	**1**	**U**		
2	**>**	**CONTAINS**	**INCLUDE**	**DTID 5302 "Post-Coordinated Echo Measurement"**	**1-n**	**U**		

Content Item Descriptions

Row 2	**Each inclusion of this row is one fully post-coordinated echo measurement.** **See Annex X, Table X-1 Examples of Post-Coordination of Fetal Cardiac Ultrasound Measurements for a list of common fetal cardiac measurements and the corresponding values of post-coordinated elements of TID 5302.** **The use of TID 5302 is not limited to the examples in Table X-1. The examples are intended to show how some common measurements are constructed and to understand common patterns.**

Add TID 5xx2 for a Fetal Cardiovascular Profile Score Section (following the pattern of TID 5009 Fetal Biophysical Profile Section)

TID 5xx2 Fetal Cardiovascular Profile Section

This Template encodes scoring observations for fetal cardiovascular well-being evaluation and a summary Cardiovascular Profile Score (CVPS) as described by Makikallio et al, Human fetal cardiovascular profile score and neonatal outcome in intrauterine growth restriction. Ultrasound Obstet Gynecol 2008; 31: 48-54 (https://obgyn.onlinelibrary.wiley.com/doi/10.1002/uog.5210)

Type: Extensible
Order: Significant
Root: No

Table TID 5xx2. Fetal Cardiovascular Profile Section

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	DT (newcode30, DCM, "Fetal Cardiovascular Profile")	1	M		
2	>	HAS OBS CONTEXT	INCLUDE	DTID 1008 “Subject Context, Fetus”	1	MC	IF this Template is invoked more than once to describe more than one fetus.	
3	>	CONTAINS	NUM	EV (newcode31, DCM, "Hydrops Fetalis Score")	1	MC	At least one of Row 3-7 shall be present	UNITS = DT ({0:2}, UCUM, "range 0:2")
4	>	CONTAINS	NUM	EV (newcode32, DCM, "Cardiothoracic Size Ratio Score")	1	MC	At least one of Row 3-7 shall be present	UNITS = DT ({0:2}, UCUM, "range 0:2")
5	>	CONTAINS	NUM	EV (newcode33, DCM, "Cardiac Function Score")	1	MC	At least one of Row 3-7 shall be present	UNITS = DT ({0:2}, UCUM, "range 0:2")
6	>	CONTAINS	NUM	EV (newcode34, DCM, "Venous Doppler Score")	1	MC	At least one of Row 3-7 shall be present	UNITS = DT ({0:2}, UCUM, "range 0:2")
7	>	CONTAINS	NUM	EV (newcode35, DCM, "Arterial Doppler Score")	1	MC	At least one of Row 3-7 shall be present	UNITS = DT ({0:2}, UCUM, "range 0:2")
8	>	CONTAINS	NUM	EV (newcode36, DCM, "Fetal Cardiovascular Profile Score")	1	U		

Content Item Descriptions

Rows 3-7	The numeric profile scores shall have a value of 0, 1, or 2 only.
Row 6	The score is based on observations of the umbilical vein and ductus venosus.
Row 7	The score is based on observations of the umbilical artery.
Row 8	The sum of Rows 3-7. The range is from 0 to the maximum possible score according the items scored in Rows 3-7.

Modify CID 12227 to add two methods related to how the measurements are taken.

CID 12227 Echocardiography Measurement Method

Resources: **HTML | FHIR JSON | FHIR XML | IHE SVS XML**

Keyword: **EchocardiographyMeasurementMethod**
FHIR Keyword: **dicom-cid-12227-EchocardiographyMeasurementMethod**
Type: **Extensible**
Version: **20yymmdd~~211112~~**
UID: **1.2.840.10008.6.1.618**

Table CID 12227. Echocardiography Measurement Method

Coding Scheme Designator	Code Value	Code Meaning
Include CID 12228 "Echocardiography Volume Method"		
Include CID 12229 "Echocardiography Area Method"		
Include CID 12230 "Gradient Method"		
Include CID 12231 "Volume Flow Method"		
Include CID 12232 "Myocardium Mass Method"		
Include CID 12310 "Myocardial Strain Method"		
DCM	**Newcode19**	**Inlet Included**
DCM	**Newcode20**	**Free Cord Loop Method**
DCM	125316	Directly measured

Modify CID 12264 to include newcid1 Fetal Arrhythmia Measurements (which Row 1 of TID 5221 pairs with CID 12282 locations, supporting these measures being performed in places like the Superior Vena Cava)

CID 12264 Cardiac Ultrasound Venous Return Systemic Measurement

Resources: **HTML | FHIR JSON | FHIR XML | IHE SVS XML**
Keyword: **CardiacUltrasoundVenousReturnSystemicMeasurement**
FHIR Keyword: **dicom-cid-12264-CardiacUltrasoundVenousReturnSystemicMeasurement**
Type: **Extensible**
Version: **20yymmdd~~100317~~**
UID: **1.2.840.10008.6.1.845**

Table CID 12264. Cardiac Ultrasound Venous Return Systemic Measurement

Coding Scheme Designator	Code Value	Code Meaning
Include CID 12220 "Echocardiography Common Measurement"		
Include CID 12222 "Orifice Flow Property"		
Include CID 12239 "Cardiac Output Property"		

Coding Scheme Designator	Code Value	Code Meaning
Include CID 12250 "Cardiac Ultrasound Common Linear Measurement"		
Include CID 12252 "Cardiac Ultrasound Cardiac Function"		
Include CID 12253 "Cardiac Ultrasound Area Measurement"		
Include CID 12254 "Cardiac Ultrasound Hemodynamic Measurement"		
Include CID 3612 "Blood Velocity Measurement"		
Include CID newcid1 "Cardiac Ultrasound Fetal Arrhythmia Measurements"		

Modify CID 12271 to include newcid1 Fetal Arrhythmia Measurements (which Row 8 of TID 5221 pairs with CID 12288 locations, supporting these measures being performed at the ventricles and their outflow tracts).

CID 12271 Cardiac Ultrasound Outflow Tract Measurement

Resources: **HTML | FHIR JSON | FHIR XML | IHE SVS XML**
Keyword: **CardiacUltrasoundOutflowTractMeasurement**
FHIR Keyword: **dicom-cid-12271-CardiacUltrasoundOutflowTractMeasurement**
Type: **Extensible**
Version: **20yymmdd~~100317~~**
UID: **1.2.840.10008.6.1.852**

Table CID 12271. Cardiac Ultrasound Outflow Tract Measurement

Coding Scheme Designator	Code Value	Code Meaning
Include CID 12257 "Cardiac Ultrasound Left Ventricle Measurement"		
Include CID 12258 "Cardiac Ultrasound Right Ventricle Measurement"		
Include CID 12262 "Cardiac Ultrasound Pulmonary Valve Measurement"		
Include CID 12270 "Cardiac Ultrasound Aortic Valve Measurement"		
Include CID newcid1 "Cardiac Ultrasound Fetal Arrhythmia Measurements"		

Modify CID 12274 to include Left Atrium Descending Aorta Distance measurement and PLAS Index.

Note: PLAS Index is used as a diagnostic marker for Total Anomalous Pulmonary Venous Connection (TAPVC), a rare congenital heart defect. It was originally added to CID 12218 Echocardiography Congenital Anomaly Measurement, however to better align with the relevant anatomical site pairings it fits better here along with newcode03 which is one of the two components of the PLAS Index.

CID 12274 Cardiac Ultrasound Aorta Measurement

Resources: **HTML | FHIR JSON | FHIR XML | IHE SVS XML**

Keyword: **CardiacUltrasoundAortaMeasurement**
FHIR Keyword: **dicom-cid-12274-CardiacUltrasoundAortaMeasurement**
Type: **Extensible**
Version: **20yymmdd~~100317~~**
UID: **1.2.840.10008.6.1.855**

Table CID 12274. Cardiac Ultrasound Aorta Measurement

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
…				
DCM	**newcode03**	**Left Atrium-Descending Aorta Distance**		
DCM	**Newcode04**	**Post-Left Atrium Space Index**		

Modify CID 12279 to match its intent/title by removing items not commonly recognized as being relevant to a cardiac ultrasound of a fetus.

All the retained codes are either measurements of cardiac/vascular features, or measurements commonly used to provide context for cardiac measurements, e.g. by providing a fetal body size reference

CID 12004 contains ratios used elsewhere for fetal growth tracking, not heart assessment.

CID 12279 Cardiac Ultrasound Fetal General Measurement

Resources: **HTML | FHIR JSON | FHIR XML | IHE SVS XML**
Keyword: **CardiacUltrasoundFetalGeneralMeasurement**
FHIR Keyword: **dicom-cid-12279-CardiacUltrasoundFetalGeneralMeasurement**
Type: **Extensible**
Version: **20yymmdd~~100317~~**
UID: **1.2.840.10008.6.1.859**

Table CID 12279. Cardiac Ultrasound Fetal General Measurement

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
~~Include CID 12004 "Fetal Biometry Ratio"~~				
LN	11988-3	Thoracic Circumference		C0552104
LN	33068-8	Thoracic Area		C1315539
LN	59073-7	Cardiac Circumference, transverse by US		C2923390
LN	59074-5	Cardiothoracic Circumference Ratio		C2923392
LN	59075-2	Cardiac Cross-sectional Area, transverse by US		C2923394
LN	59076-0	Cardiothoracic Area Ratio		C2923396
~~**LN**~~	~~**11820-8**~~	~~**Biparietal Diameter**~~		~~**C0551937**~~

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
~~LN~~	~~33069-6~~	~~Nuchal Translucency~~		~~C1315540~~
~~LN~~	~~11963-6~~	~~Femur Length~~		~~C0552080~~
~~LN~~	~~11979-2~~	~~Abdominal Circumference~~		~~C0552095~~
~~LN~~	~~11818-2~~	~~Anterior-Posterior Abdominal Diameter~~		~~C0551935~~
~~LN~~	~~11819-0~~	~~Anterior-Posterior Trunk Diameter~~		~~C0551936~~
~~LN~~	~~11824-0~~	~~BPD area corrected~~		~~C0551941~~
~~LN~~	~~11860-4~~	~~Cisterna Magna Length~~		~~C0551977~~
~~LN~~	~~11984-2~~	~~Head Circumference~~		~~C0552100~~
~~LN~~	~~11851-3~~	~~Occipital-Frontal Diameter~~		~~C0551968~~
~~LN~~	~~11862-0~~	~~Transverse Abdominal Diameter~~		~~C0551979~~
~~LN~~	~~11863-8~~	~~Transverse Cerebellar Diameter~~		~~C0551980~~
LN	11864-6	Transverse Thoracic Diameter		C0551981
LN	59077-8	Foramen Ovale Diameter/Aortic Root Diameter		C2923398
LN	59078-6	Left Ventricle/Right Ventricle Diameter Ratio		C2923400
SCT	249192005	Number of umbilical arteries	F-00AA0	C0426250

Modify CID 12290 to add several codes

CID 12290 Cardiac Ultrasound Pulmonary Artery Finding Site

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML
Keyword: CardiacUltrasoundPulmonaryArteryFindingSite
FHIR Keyword: dicom-cid-12290-CardiacUltrasoundPulmonaryArteryFindingSite
Type: Extensible
Version: ~~20100317~~yyyymmdd
UID: 1.2.840.10008.6.1.870

Table CID 12290. Cardiac Ultrasound Pulmonary Artery Finding Site

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	45341000	Pulmonary Trunk	T-44100	C0034052
SCT	**50408007**	**Left Pulmonary Artery**	**T-44400**	**C0226069**
SCT	**78480002**	**Right Pulmonary Artery**	**T-44200**	**C0226054**
SCT	81040000	Pulmonary Artery	T-44000	C0034052
SCT	443096004	Aorta to Pulmonary Artery Connection	T-D0877	C2732457

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	**4432005**	**Ductus Arteriosus**	**T-F6845**	

Modify CID 12291 to add two codes

CID 12291 Cardiac Ultrasound Aorta Finding Site

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML
Keyword: CardiacUltrasoundAortaFindingSite
FHIR Keyword: dicom-cid-12291-CardiacUltrasoundAortaFindingSite
Type: Extensible
Version: ~~20170914~~**yyyymmdd**
UID: 1.2.840.10008.6.1.871

Table CID 12291. Cardiac Ultrasound Aorta Finding Site

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	**13418002**	**Left Ventricle Outflow Tract**	**T-32650**	**C0225912**
SCT	**34202007**	**Aortic Valve**	**T-35400**	**C0003501**
SCT	8128003	Root of Aorta	T-42110	C0549113
SCT	81128002	Structure Sinus of Valsalva	T-42200	C0037197
SCT	36371001	Left Sinus of Valsalva	T-42220	C0226017
SCT	89093001	Right Sinus of Valsalva	T-42210	C0226016
SCT	24865005	Non-coronary Sinus	T-42230	C0226018
SCT	443167003	Aortic Sinotubular Junction	T-42102	C2733424
SCT	54247002	Ascending Aorta	T-42100	C0003956
SCT	57034009	Aortic Arch	T-42300	C0003489
SCT	88593004	Aortic Isthmus	T-42310	C0226019
SCT	7305005	Coarctation of Aorta	D4-32014	C0003492
SCT	**32672002**	**Descending Aorta**		
SCT	**281130003**	**Descending Thoracic Aorta**		
SCT	113262008	Thoracic Aorta	T-42070	C1522460
SCT	7832008	Abdominal Aorta	T-42500	C0003484
SCT	1918003	Supra Renal Aorta	T-42510	C0226024
SCT	28205006	Infra-Renal Aorta	T-42520	C0226025
SCT	12691009	Innominate Artery	T-46010	C0006094
SCT	65355003	Right Common Carotid Artery	T-45110	C0226086
SCT	29700009	Right Subclavian Artery	T-46110	C0226261

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	113263003	Left Common Carotid Artery	T-45120	C0226087
SCT	85235006	Left Subclavian Artery	T-46120	C0226262

Modify CID 12304 to add codes
https://dicom.nema.org/medical/dicom/current/output/chtml/part16/sect_CID_12304.html

CID 12304 Echo Measured Property

The Units column contains the proper UCUM representation of the recommended units for the measured property.

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML
Keyword: EchoMeasuredProperty
FHIR Keyword: dicom-cid-12304-EchoMeasuredProperty
Type: Extensible
Version: ~~20231114~~yyyymmdd
UID: 1.2.840.10008.6.1.1145

Table CID 12304. Echo Measured Property

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
…				
SCT	82799009	Cardiac Output	F-32100	C0007165
LN	12008-9	Pulsatility Index		C0552113
LN	12023-8	Resistivity Index		C0552128
DCM	Newcode13	Peak Velocity Index		
…				

Modify CID 12305 to add codes
https://dicom.nema.org/medical/dicom/current/output/chtml/part16/sect_CID_12305.html

CID 12305 Basic Echo Anatomic Site

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML
Keyword: BasicEchoAnatomicSite
FHIR Keyword: dicom-cid-12305-BasicEchoAnatomicSite
Type: Extensible
Version: ~~20210904~~yyyymmdd
UID: 1.2.840.10008.6.1.1146

Table CID 12305. Basic Echo Anatomic Site

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
…				
SCT	**80891009**	**Heart**	**T-32000**	**C0018787**
…				
SCT	**27706005**	**Left Pulmonary Vein**	**T-48502**	**C0226670**
…				
SCT	**70238003**	**Left Ventricle Inflow Tract**		
…				
SCT	**91539005**	**Right Pulmonary Vein**	**T-48501**	**C0226669**
…				
SCT	**8017000**	**Right Ventricle Inflow Tract**		
…				
SCT	**48345005**	**Superior Vena Cava**	**T-48610**	**C0042459**
…				

Add a new CID for Fetal Cardiac Views to Part 16 Annex B:

CID 12226. Echocardiography Image View incorporates too much (maternal) anatomy on top of the heart orientation

CID 27. Basic Cardiac View contains 3 codes (which are relevant) but our additions are likely not relevant to the existing NM usage of the Basic View

CID newcid0 Fetal Echocardiography Image View

Resources: **HTML | FHIR JSON | FHIR XML | IHE SVS XML**
Keyword: **FetalEchocardiographyImageView**
FHIR Keyword: **dicom-cid-newcid1-FetalEchocardiographyImageView**
Type: **Extensible**
Version: **20yymmdd**
UID: **1.2.840.10008.6.1.newcidUID0**

Table CID newcid0. Fetal Echocardiography Image View

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	103340004	Short Axis	G-A186	C0522488
SCT	131185001	Vertical Long Axis	G-A18A	C1295721
SCT	131186000	Horizontal Long Axis	G-A18B	C1295722
DCM	Newcode29	Four chamber view		

DCM	Newcode22	Aortic arch view		
DCM	Newcode23	Oblique short axis view at ductus arteriosus		
DCM	Newcode24	Short axis view at pulmonary artery level		
DCM	newcode25	Three vessel view		
DCM	Newcode26	Three vessel and trachea view		
DCM	Newcode28	Left ventricular outflow tract view		
SCT	399195005	Right ventricular outflow tract view		

Add a new CID for Fetal Arrhythmia Measurements to Part 16 Annex B:

CID newcid1 Cardiac Ultrasound Fetal Arrhythmia Measurements

Resources: **HTML | FHIR JSON | FHIR XML | IHE SVS XML**
Keyword: **CardiacUltrasoundFetalArrhythmiaMeasurements**
FHIR Keyword: **dicom-cid-newcid1-CardiacUltrasoundFetalArrhythmiaMeasurements**
Type: **Extensible**
Version: **20yymmdd**
UID: **1.2.840.10008.6.1.newcidUID1**

Table CID newcid1. Cardiac Ultrasound Fetal Arrhythmia Measurements

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
DCM	newcode05	Atrial Heart Rate		
DCM	newcode06	Ventricular Heart Rate		
DCM	newcode02	Atrioventricular time interval		
DCM	newcode01	Ventriculoatrial time interval		

Add the following Definitions to Annex D

DICOM Code Definitions (Coding Scheme Designator "DCM" Coding Scheme Version "01")

Code Value	Code Meaning	Definition	Notes
121026	Distance	A one dimensional, or linear, numeric measurement **between two points or features**.	
…			

newcode01	Ventriculoatrial Time Interval	Ventriculoatrial time interval (VA time), defined as the interval between the onset of ventricular systole and the onset of atrial systole.	Recommended for assessment of Fetal arrhythmia per Fetal Echo Guideline Japan – Second edition 2021. Commonly measured by doppler using a view aligned with a pair of locations: the Superior Vena Cava and the Ascending Aorta, or the Left Ventricular Inflow Tract and the Left Ventricular Outflow Tract, or a Pulmonary Artery and Pulmonary Vein. In a coded measurement, when only one finding location is recorded, the partner location is implicit.
Newcode02	Atrioventricular Time Interval	Atrioventricular time interval (AV time or AVI), defined as the interval between the onset of atrial systole and the onset of ventricular systole.	Commonly measured by doppler using a view aligned with a pair of locations: the Superior Vena Cava (SVC) and the Ascending Aorta, or the Left Ventricular Inflow Tract and the Left Ventricular Outflow Tract, or a Pulmonary Artery and a Pulmonary Vein. In a coded measurement, when only one finding location is recorded, the partner location is implicit.
Newcode03	Left Atrium-Descending Aorta Distance	The shortest distance (LD) between any point on the inside of the atrium wall and any point on the outside of the descending thoracic aorta wall measured in a four-chamber view of the heart.	

Newcode04	Post-Left Atrium Space Index	Post-Left Atrium Space (PLAS) Index is the distance between the left atrium and the descending thoracic aorta divided by the diameter of the descending thoracic aorta, where both measurements are taken in the same view (thus defining the point in the descending thoracic aorta for the diameter measurement). Reference: http://jpccs.jp/10.9794/jspccs.32.387/data/index.html	Used in fetal echo for diagnosis of isolated Total Anomalous Pulmonary Venous Connection (TAPVC).
Newcode05	Atrial Heart Rate	The number of contraction cycles of the atrium per minute.	This may be determined by observation of the ventricle wall motion.
Newcode06	Ventricular Heart Rate	The number of contraction cycles of the ventricle per minute.	This may be determined by observation of the ventricle wall motion.
Newcode09	Cerebroplacental ratio	The pulsatility index at the middle cerebral artery of the fetus divided by the pulsatility index at the umbilical artery proximal to the fetus.	
newcode10	Umbilicocerebral ratio	The pulsatility index at the umbilical artery divided by the pulsatility index at the middle cerebral artery of the fetus.	
Newcode11	IVC Preload index	The ratio of the peak retrograde flow during the A-wave to the peak forward flow during the S-wave, as measured at the inferior vena cava using pulsed-wave doppler.	https://pubmed.ncbi.nlm.nih.gov/2130842/ (1990) https://obgyn.onlinelibrary.wiley.com/doi/full/10.1002/uog.142
Newcode12	IVC S/a	The ratio of the peak forward flow during the S-wave to the peak retrograde flow during the A-wave, as measured at the inferior vena cava using pulsed-wave doppler. This is the inverse of the Preload index.	
Newcode13	Peak Velocity Index	A blood flow index calculated by subtracting the peak retrograde flow during the A-wave from the peak forward flow during the S-wave, then dividing by the peak forward flow during the D-wave, i.e., (S-a)/D.	https://obgyn.onlinelibrary.wiley.com/doi/10.1002/uog.902
Newcode14	DV Pulsatility Index in Veins (PIV)	The pulsatility index measured in the ductus venosus during the full cardiac cycle in pulsed doppler mode in any view.	

Newcode15	DV Peak Velocity Index in Veins (PVIV)	The peak velocity index measured in the ductus venosus during the full cardiac cycle in pulsed doppler mode in any view.	
Newcode17	Right ventricular inlet length	The length of the right ventricle measured at end diastole in 2D mode using a method that includes the inlet portion of the chamber in any view.	
Newcode18	Left ventricular inlet length	The length of the left ventricle measured at end diastole in 2D mode using a method that includes the inlet portion of the chamber in any view.	
Newcode19	Inlet Included	A method of measuring a cardiac chamber length that includes the inlet portion of the chamber in the length.	
Newcode20	Free Cord Loop Method	A method of measuring hemodynamics in the umbilical cord by taking the measurement in a free loop of the cord. A free loop is a portion of the umbilical cord that is not attached to the fetal body or the placenta and is instead floating freely within the amniotic fluid.	
Newcode21	Ductus Arteriosus Arch	The ductal arch formed by the ductus arteriosus as it travels from its origin at the pulmonary artery to the point of entry into the descending aorta.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5030054/pdf/AJUM-16-168.pdf
Newcode22	Aortic arch view	A planar view of the heart showing the aortic valve, ascending aorta, aortic arch, descending aorta and inferior vena cava.	
Newcode23	Oblique short axis view at ductus arteriosus	A planar oblique short-axis view of the heart showing the pulmonary trunk (main pulmonary artery, right pulmonary artery) and the ductus arteriosus.	
Newcode24	Short axis view at pulmonary artery level	A planar short-axis view of the heart showing the pulmonary valve, main pulmonary artery, right and left pulmonary arteries.	
Newcode25	Three vessel view	An axial planar view of the heart showing the main pulmonary artery, ascending aorta in cross-section, and superior vena cava (SVC) in cross-section. One or both branch pulmonary arteries may also be included.	Sometimes referred to by the abbreviation 3VV.

Newcode26	Three vessel and trachea view	An axial planar view of the heart showing the trachea and the aortic and ductal arches converging to form the proximal descending thoracic aorta.	Sometimes referred to by the abbreviation 3VT.
Newcode27	Umbilical Artery at Fetus	The portion of the umbilical artery that is proximal to the fetus.	
Newcode28	Left ventricular outflow tract view	An axial planar view of the heart showing the subaortic area, aortic valve, supravalvular region, and ascending aorta.	
Newcode29	Four chamber view	An axial planar view of the heart showing both ventricles and both atria. The view does not necessarily include the apex of the heart.	
Newcode30	Fetal Cardiovascular Profile	Report section for assessment of cardiovascular observations that evaluate fetal well-being	
Newcode31	Hydrops Fetalis Score	A point-based assessment of abnormal fluid accumulation in fetal body areas. This is a component of the Fetal Cardiovascular Profile Score.	
Newcode32	Cardiothoracic Size Ratio Score	A point-based assessment of heart size relative to thoracic size based on observations of the circumferences or areas. This is a component of the Fetal Cardiovascular Profile Score.	
Newcode33	Cardiac Function Score	A point-based assessment of cardiac function based on observations of valve inflow and regurgitation patterns and ventricular shortening. This is a component of the Fetal Cardiovascular Profile Score.	
Newcode34	Venous Doppler Score	A point-based assessment of venous flow based on Doppler observations of the umbilical vein and ductus venosus. This is a component of the Fetal Cardiovascular Profile Score.	
Newcode35	Arterial Doppler Score	A point-based assessment of arterial flow based on Doppler observations of the umbilical artery. This is a component of the Fetal Cardiovascular Profile Score.	

Newcode36	Fetal Cardiovascular Profile Score	A point-based score (CVPS) that sums the scores of five component assessments of cardiovascular observations to evaluate fetal well-being according to Makikallio et al, Human fetal cardiovascular profile score and neonatal outcome in intrauterine growth restriction. Ultrasound Obstet Gynecol 2008; 31: 48-54 https://obgyn.onlinelibrary.wiley.com/doi/10.1002/uog.5210	
Newcode50	PV VTI Forward	The velocity time integral measured in the pulmonary vein for the antegrade flow during the full cycle in pulsed doppler mode in any view. Forward flow occurs during the D-wave and the S-wave.	
Newcode51	PV VTI Reverse	The velocity time integral measured in the pulmonary vein for the retrograde flow during the A-wave in pulsed doppler mode in any view.	
Newcode52	PV VTIR/VTIF Ratio	The ratio of the retrograde velocity time integral to the antegrade velocity time integral at the pulmonary vein.	
Newcode53	Right Ventricle Cardiac Output	The volume rate of blood output by the right ventricle derived from the right ventricle stroke volume and heart rate.	
Newcode54	Combined Cardiac Output	The volume rate of blood output by the heart derived from the cardiac output of the left and right ventricles.	
Newcode60	Mitral valve annulus diameter	The diameter of the annulus of the mitral valve measured during diastole in 2D mode in a short axis view at the level of the mitral valve.	
Newcode61	Tricuspid valve annulus diameter	The diameter of the annulus of the tricuspid valve measured during diastole in 2D mode in a short axis view at the level of the mitral valve.	
Newcode62	IVC S-wave Peak Velocity	The peak velocity measured in the inferior vena cava during the S-wave in pulsed doppler mode in any view.	
Newcode63	IVC a-wave Peak Velocity	The peak velocity measured in the inferior vena cava during the a-wave in pulsed doppler mode in any view.	

Modify PS3.16 Annex H as shown

Table H-1. Code Meanings of LOINC Codes

Code Value	Code Meaning
…	
12023-8	**Resistive Index**
12023-8	**Pourcelot Index**
…	

Add PS3.16 Annex X TID 5xxx for a section of Post-Coordinated Echo Measurements

Annex X Post-coordinated Fetal Cardiac Ultrasound Measurement Examples (Informative)

Table X-1 provides examples of common fetal cardiac ultrasound measurements and demonstrates how key rows of TID 5302 can be populated to encode them as Post-coordinated Echo Measurements.

Row 1 of TID 5302 contains a fully pre-coordinated code which encompasses the details in the subsequent rows of TID 5302. Table X-1 has a Pre-Coord column which offers such a pre-coordinated code value for the measurement. If a code is not present, the recording system is responsible for finding or creating a code, as described in the Content Item Descriptions for TID 5302 Row 1.

Table X-1. Examples of Post-Coordination of Fetal Cardiac Ultrasound Measurements

Nominal Measurement	Key Post-Coordinated Elements of TID 5302				Pre-Coord	Notes
	Finding Site	Measured Property	Image Mode	Cardiac Cycle Point		
TID 5302 – Row 1 (Code Meaning)	**Row 8**	**Row 10**	**Row 13**	**Row 15**	**Row 1 (Code Value)**	
Measurement Type = Direct						
PV S-wave peak velocity	(430757002, SCT, "Pulmonary Vein")	(20355-4, LN, "Peak Blood Velocity")	PW Dop	(444371003, SCT, "S-wave")	LN 79917-1	
PV D-wave peak velocity	Pulmonary Vein	Peak Blood Vel	PW Dop	D-wave	LN 79916-3	
IVC S-wave peak velocity	Inferior Vena Cava	Peak Blood Flow	PW Dop	S-wave	DCM Newcode62	
Mitral valve annulus diameter	Mitral Valve Annulus	Diameter	2D	Diastole	DCM Newcode60	
Tricuspid valve annulus diameter	Tricuspid Valve Annulus	Diameter	2D	Diastole	DCM Newcode61	

Right ventricular inlet length	Right Ventricle	Length	2D	End Diastole	DCM Newcode17	Method=Inlet Included
Left ventricular inlet length	Left Ventricle	Length	2D	End Diastole	DCM Newcode18	Method=Inlet Included
Mitral a-wave peak velocity	Mitral Valve	Peak Blood Vel	PW Dop	A-wave	LN 80066-4	
Tricuspid a-wave peak velocity	Tricuspid Valve	Peak Blood Vel	PW Dop	A-wave	LN 79923-9	
IVC a-wave peak velocity	Inferior Vena Cava	Peak Blood Flow	PW Dop	A-wave	DCM Newcode63	
Mitral E-wave peak velocity	Mitral Valve	Peak Blood Vel	PW Dop	E-wave	LN 80070-6	
Tricuspid E-wave peak velocity	Tricuspid Valve	Peak Blood Vel	PW Dop	E-wave	LN 79925-4	
Mitral septal e' peak velocity	Medial Mitral Annulus	Peak Tissue Vel	TDI	E-wave	LN 78185-6	
Mitral septal a' peak velocity	Medial Mitral Annulus	Peak Tissue Vel	TDI	A-wave	LN 81396-4	
Mitral septal s' peak velocity	Medial Mitral Annulus	Peak Tissue Vel	TDI	S-wave	LN 78187-2	
Mitral lateral e' peak velocity	Lateral Mitral Annulus	Peak Tissue Vel	TDI	E-wave	LN 78186-4	
Mitral lateral a' peak velocity	Lateral Mitral Annulus	Peak Tissue Vel	TDI	A-wave	LN 81397-2	
Mitral lateral s' peak velocity	Lateral Mitral Annulus	Peak Tissue Vel	TDI	S-wave	LN 78188-0	
LVOT VTI	LV Outflow Tract	VTI	PW Dop	Systole	LN 80030-0	Flow=Antegrade
RVOT VTI	RV Outflow Tract	VTI	PW Dop	Systole	LN 80089-6	Flow=Antegrade
LV Stroke Volume	Left Ventricle	Stroke Volume	PW Dop	Systole	LN 8769-2	Method=Doppler Volume Flow
RV Stroke Volume	Right Ventricle	Stroke Volume	PW Dop	Systole	LN 8779-1	Method=Doppler Volume Flow
LVCO (Left Ventricle Cardiac Output)	Left Ventricle	Cardiac Output	PW Dop	Systole	LN 8735-3	To index by fetal weight, Measurement Type would be Indexed, and Measurement Divisor would be Fetal Weight, the value of which would be recorded elsewhere.
RVCO (Right Ventricle Cardiac Output)	Right Ventricle	Cardiac Output	PW Dop	Systole	DCM Newcode53	
CCO (Combined Cardiac Output)	Heart	Cardiac Output	PW Dop	Systole	DCM Newcode54	
DA (Descending Aorta Diameter)	Descending Aorta	Diameter	B-mode	End Systole	LN 18013-3	

UA Resistivity Index	(50536004, SCT, "Umbilical artery")	Resistivity index	PW Dop	Full Cycle	LN 12018-8	Method = Free Cord Loop
Fetal ACA Resistivity Index	(60176003, SCT, "Anterior Cerebral Artery")	Resistivity index	PW Dop	Full Cycle	LN 12012-1	
Fetal MCA Resistivity Index	(17232002, SCT, "Middle Cerebral Artery")	Resistivity index	PW Dop	Full Cycle	LN 12014-7	
UA Pulsatility Index	(50536004, SCT, "Umbilical artery")	Pulsatility Index	PW Dop	Full Cycle	LN 12003-0	Method = Free Cord Loop
MCA Pulsatility Index	(17232002, SCT, "Middle Cerebral Artery")	Pulsatility Index	PW Dop	Full Cycle	LN 11999-0	
DV Pulsatility Index in Veins (PIV)	(367624001, SCT, "Ductus Venosus")	Pulsatility Index	PW Dop	Full Cycle	DCM Newcode14	
DV Peak Velocity Index in Veins (PVIV)	(367624001, SCT, "Ductus Venosus")	Peak Velocity Index	PW Dop	Full Cycle	DCM Newcode15	
PV VTI Forward	Pulmonary Vein	VTI	PW Dop	Full Cycle	DCM Newcode50	Flow=Antegrade
PV VTI Reverse	Pulmonary Vein	VTI	PW Dop	A-Wave	DCM Newcode51	Flow=Retrograde
Measurement Type = Ratio						
PV VTIR/VTIF ratio	Pulmonary Vein	VTI	PW Dop	A-Wave	DCM Newcode52	Measurement Divisor = PV VTI Forward
Mitral Septal E/e' ratio	Mitral Valve	Peak Blood Vel	PW Dop	E-Wave	LN 78189-8	Measurement Divisor = Mitral Septal e' peak velocity
Mitral Lateral E/e' ratio	Mitral Valve	Peak Blood Vel	PW Dop	E-Wave	LN 78190-6	Measurement Divisor = Mitral Lateral e' peak velocity
CPR Cerebroplacental Ratio	(17232002, SCT, "Middle Cerebral Artery")	Pulsatility Index	PW Dop	Full Cycle	DCM newcode09	Measurement Divisor = Umbilical Artery Pulsatility Index
Umbilicocerebral Ratio	(50536004, SCT, "Umbilical artery")	Pulsatility Index	PW Dop	Full Cycle	DCM newcode10	Measurement Divisor = MCA Pulsatility Index Method = Free Cord Loop Method

IVC Preload index (a/S)	Inferior Vena Cava	Peak Blood Vel	PW Dop	A-Wave	DCM Newcode11	Flow=Retrograde (during numerator) Measurement Divisor = IVC S-wave peak velocity
IVC S/a	Inferior Vena Cava	Peak Blood Vel	PW Dop	S-wave	DCM Newcode12	Flow=Antegrade (during numerator) Measurement Divisor = IVC a-wave peak velocity